



MATHEMATICS TEST

60 Minutes—60 Questions

**DIRECTIONS:** Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later.

DO YOUR FIGURING HERE.

1. One foot is equivalent to approximately 0.3048 meters. If a building is 65-feet long, what is the length of the building in meters, to the nearest tenth?  
A. 19.8  
B. 31.1  
C. 65.3  
D. 198.1  
E. 213.3
2. To keep up with rising costs, a carpenter needs to increase his \$30.00 per hour rate by 18%. What will be his new hourly rate?  
F. \$30.18  
G. \$31.80  
H. \$35.40  
J. \$38.00  
K. \$48.00
3. Contributions to the school dance fund are made by each of 4 student groups according to the table below.
- | Student group           | A  | B  | C  | D  |
|-------------------------|----|----|----|----|
| Contribution in dollars | 25 | 40 | 30 | 15 |
- What is the average dollar amount of the contributions made by the 4 student groups?  
A. \$110.00  
B. \$55.00  
C. \$35.00  
D. \$27.50  
E. \$22.50
4. Bus X travels 40 miles per hour for 2 hours; Bus Y travels 60 miles per hour for  $1\frac{1}{2}$  hours. What is the difference, in miles, between the number of miles traveled by Bus X and the number of miles traveled by Bus Y?  
F. 10  
G. 20  
H. 50  
J. 80  
K. 90

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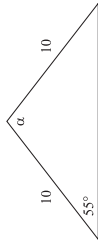
DO YOUR FIGURING HERE.

5. Which of the following is a value of  $r$  for which  $(r+2)(r-3)=0$ ?  
A. 6  
B. 0  
C. -2  
D. -3  
E. -6
6. In the parallelogram  $PQRS$  shown below,  $PS$  is 7 centimeters long. If the parallelogram's perimeter is 40 centimeters, how many centimeters long is  $PQ$ ?
- 
7. In the standard  $(x,y)$  coordinate plane, if the  $x$ -coordinate of each point on a line is 5 more than half the  $y$ -coordinate, what is the slope of the line?  
A. -5  
B.  $-\frac{1}{2}$   
C.  $\frac{1}{2}$   
D. 2  
E. 5
8. A rectangular garden has a length of  $x$  and a width of  $y$ . The garden has its length reduced by 3 feet and its width extended by 2 feet. What is the area of the new garden?  
F.  $x+y$   
G.  $(x-3)(y-2)$   
H.  $(x+3)(y+2)$   
J.  $(x-3)(y+2)$   
K.  $(x+3)(y-2)$
9. If  $x = 3yz^2$ , what is  $y$  in terms of  $x$  and  $z$ ?  
A.  $\frac{x}{3z^2}$   
B.  $3xz^2$   
C.  $\left(\frac{1}{3}\right)xz^2$   
D.  $\frac{z^2y}{3x}$   
E.  $\frac{\sqrt{x}}{3z}$

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10. In the figure below, what is the measure of  $\angle a$ ?



- F.  $20^\circ$   
 G.  $55^\circ$   
 H.  $70^\circ$   
 J.  $75^\circ$   
 K.  $110^\circ$

11. Which of the following is the product of

- ( $3x^2 - 1$ )( $x^2 - 4$ )?  
 A.  $3x^4 + 13x^2 + 4$   
 B.  $3x^4 + 5$   
 C.  $3x^4 - 13x^2 + 4$   
 D.  $3x^4 - 12x^2 + 4$   
 E.  $3x^4 + 12x^2 + 4$

12. In the standard  $(x, y)$  coordinate plane, if a square has the vertices  $(-2, -3)$ ,  $(2, -3)$ , and  $(2, 1)$ , what is the set of coordinates for the final vertex?

- F.  $(2, -1)$   
 G.  $(1, -2)$   
 H.  $(-1, 2)$   
 J.  $(-2, -1)$   
 K.  $(-2, 1)$

13. Reduce  $\frac{x^8 y^{12}}{x^4 y^3 z^2}$  to its simplest terms.

- A.  $\frac{x^2 y^4}{z^2}$   
 B.  $\frac{x^4 y^9}{z^2}$   
 C.  $x^4 y^9 z^2$   
 D.  $x^2 y^{12} z^2$   
 E.  $\frac{x^2 y^9}{z^2}$

14. Which of the following is a value of  $n$  that satisfies  $\log_8 64 = 2$ ?

- F. 4  
 G. 6  
 H. 8  
 J. 12  
 K. 52

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DO YOUR FIGURING HERE.

15. A survey is conducted among 700 high-school students to see who their favorite college basketball teams are. If 250 students like the Hawks, 200 students like the Vikings, 50 students like the Bears, and the remaining students like the Warriors, approximately what percentage of the 700 high school students answered that the Warriors were their favorite team? (round to the nearest tenth of a percentage point)

- A. 14.3%  
 B. 28.6%  
 C. 42.9%  
 D. 56.2%  
 E. 78.6%

16. If  $x^2 = 36$  and  $y^2 = 81$ , which of the following CANNOT be the value of  $x + y$ ?

- F. -15  
 G. -3  
 H. 0  
 J. 3  
 K. 15

17. A system of linear equations is shown below.

$$4y = 3x + 12$$

$$-4y = -3x - 8$$

Which of the following describes the graph of this system of linear equations in the standard  $(x, y)$  coordinate plane?

- A. Two parallel lines with negative slope  
 B. Two parallel lines with positive slope  
 C. A single line with negative slope  
 D. A single line with positive slope  
 E. Two perpendicular lines

18.  $\frac{-6}{|-3|} = ?$

- F. -3  
 G. -2  
 H. 0  
 J. 2  
 K. 9

19. What are the values for  $a$  that satisfy the equation  $(a + y)(a + z) = 0$ ?

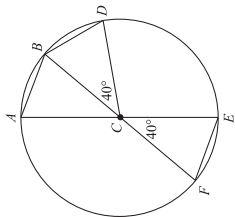
- A.  $-y$  and  $-z$   
 B.  $-y$  and  $z$   
 C.  $-yz$   
 D.  $y$  and  $-z$   
 E.  $y$  and  $z$

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DO YOUR FIGURING HERE.

20. In the circle shown below,  $C$  is the center and lies on segments  $\overline{AE}$  and  $\overline{BF}$ . Which of the following statements is NOT true?



- F.  $\angle BAC$  measures  $70^\circ$   
 G.  $\overline{AB}$  is parallel to  $\overline{EF}$   
 H.  $\overline{AB} \cong \overline{BD}$   
 J.  $\angle BCE \cong \angle DCF$   
 K.  $\overline{CF} \cong \overline{EF}$

21. What is the slope of the line given by the equation  $21x - 3y + 18 = 0$ ?

- A.  $-7$   
 B.  $-3$   
 C.  $\frac{6}{7}$   
 D.  $\frac{7}{6}$   
 E.  $7$

22. Which of the following is the least common denominator for the expression below?

$$\frac{1}{a^2 \times b \times c} + \frac{1}{b^2 \times c} + \frac{1}{b \times c^2}$$

- F.  $b \times c$   
 G.  $a \times b \times c$   
 H.  $a^2 \times b \times c$   
 J.  $a^2 \times b^2 \times c^2$   
 K.  $a^2 \times b^4 \times c^5$

23. What number can you add to the numerator and denominator of  $\frac{5}{8}$  to get  $\frac{1}{2}$ ?

- A.  $-5$   
 B.  $-3$   
 C.  $-2$   
 D.  $0$   
 E.  $1$

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DO YOUR FIGURING HERE.

24. If  $x + y = 13$  and  $2y = 16$ , what is the value of  $x$ ?

- E. 4  
 G. 5  
 H. 7  
 J. 8  
 K. 9

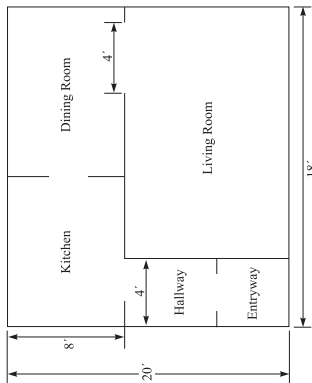
25. If the inequality  $|m| > |n|$  is true, then which of the following must be true?

- A.  $m = n$   
 B.  $m \neq n$   
 C.  $m < n$   
 D.  $m > n$   
 E.  $m > 0$

26. Given that  $y - 5 = \frac{1}{2}x + 1$  is the equation of a line, at what point does the line cross the  $x$  axis?

- F.  $-15$   
 G.  $-12$   
 H.  $1$   
 J.  $4$   
 K.  $6$

Use the following information to answer Questions 27 and 28.



The figure above shows the plan for the ground floor of a townhouse. The thickness of the walls should be ignored when answering the questions. The dimensions shown are in feet, and each region is rectangular.

27. What is the area, in square feet, of the living room?

- A. 360  
 B. 280  
 C. 216  
 D. 168  
 E. 120

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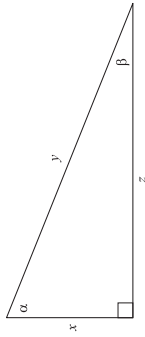
28. What is the perimeter, in feet, of the ground floor of the townhouse?

- F. 76
- G. 80
- H. 92
- J. 180
- K. 360

29. Three years ago, the population of a certain species of bird was calculated at 20 birds per acre. This year, a biologist recorded a total of 47 birds in an area equal to 3.25 acres. By about what percentage has the bird population in the biologist's sample decreased over the last 3 years, to the nearest tenth?

- A. 14.7%
- B. 27.7%
- C. 38.3%
- D. 42.6%
- E. 72.3%

30. A right triangle that has sides measured in the same unit of length is shown below. For any such triangle,  $(\tan \alpha)(\sin \beta)$  is equivalent to:



- F.  $\frac{x}{z}$
- G.  $\frac{x^2}{z^2}$
- H.  $\frac{z}{y}$
- J.  $\frac{z}{y^2}$
- K.  $\frac{z^2}{x}$

31. For all  $x > 0$ ,  $\frac{1}{x} + \frac{3}{4} = ?$

- A.  $\frac{3}{4x}$
- B.  $\frac{4}{4x}$
- C.  $\frac{4+3x}{4x}$
- D.  $\frac{4}{4+x}$
- E.  $\frac{4+3x}{4+x}$



32. If  $\cos A = \frac{4}{5}$  and  $\sin A = \frac{3}{5}$ , then  $\tan A = ?$

- F.  $\frac{3}{4}$
- G.  $\frac{3}{5}$
- H.  $\frac{4}{5}$
- J.  $\frac{4}{3}$
- K.  $\frac{12}{5}$

33. In the  $(x, y)$  coordinate plane, what is the  $y$ -intercept of the line  $5x + 3y = 8$ ?

- A.  $\frac{8}{3}$
- B. 3
- C.  $\frac{5}{3}$
- D.  $\frac{3}{5}$
- E.  $-\frac{5}{3}$

34. If  $\frac{a^x}{a^y} = a^4$  for all  $a \neq 0$ , which of the following must be true?

- F.  $\sqrt{xy} = 4$
- G.  $x \times y = 4$
- H.  $x + y = 4$
- J.  $x - y = 4$
- K.  $x \div y = 4$

35. In a certain music store, CDs were put on display and assigned prices for May. Each month after that, the price was 20% less than the price for the previous month. If the price of a CD was  $d$  dollars in May, what was the price in August?

- A.  $0.2d$
- B.  $0.3d$
- C.  $0.512d$
- D.  $0.64d$
- E.  $0.8d$

36. If  $|5 - 2x| > 5$ , which of the following is a possible value of  $x$ ?

- F. 2
- G. 3
- H. 4
- J. 5
- K. 6



DO YOUR FIGURING HERE.

37. What value of  $t$  will satisfy the equation  $0.1(t + 3,420) = t$ ?
- A.  $-3,420$   
B.  $-313.64$   
C.  $313.64$   
D.  $342$   
E.  $380$

38. What is the slope of any line parallel to the  $y$ -axis in the  $(x, y)$  coordinate plane?
- F.  $-1$   
G.  $0$   
H.  $1$   
J. Undefined  
K. Cannot be determined from the given information

39. Which one of the following lines has the smallest slope?
- A.  $y = x + 6$   
B.  $y = 2x + 10$   
C.  $y = \frac{1}{2}x - 1$   
D.  $5y = 15x + 4$   
E.  $7y = 3x - 7$

40. Amy can run 3.5 miles in  $x$  minutes. At that pace, how many minutes would it take her to run 10.5 miles?
- F.  $10.5x$   
G.  $7x$   
H.  $4x$   
J.  $3.5x$   
K.  $3x$

41. A certain rectangle is 5 times as long as it is wide. Suppose the length and width are both tripled. The perimeter of the second rectangle is how many times as large as the perimeter of the first rectangle?
- A. 3  
B. 5  
C. 6  
D. 12  
E. 15

42. If  $r$  and  $s$  are constants and  $x^2 + rx + 12$  is equivalent to  $(x + 3)(x + s)$ , what is the value of  $r$ ?
- F. 3  
G. 4  
H. 7  
J. 12  
K. Cannot be determined from the given information

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DO YOUR FIGURING HERE.

43. For what value of  $b$  would the following system of equations have an infinite number of solutions?

$$\begin{aligned} 3x + 5y &= 27 \\ 12x + 20y &= 3b \end{aligned}$$

- A. 9  
B. 27  
C. 36  
D. 81  
E. 126

44. Which of the following calculations will yield an even integer for any integer  $a$ ?

- F.  $2a^2 + 3$   
G.  $4a^3 + 1$   
H.  $5a^2 + 2$   
J.  $6a^4 + 6$   
K.  $a^6 - 3$

45. What is the solution set of  $|3a - 3| \geq 12$ ?

- A.  $a \geq 5$  and  $a \leq -5$   
B.  $a \geq 5$  and  $a \leq -3$   
C.  $a \geq -5$  and  $a \leq 5$   
D.  $a \geq -5$  and  $a \leq 3$   
E.  $a \leq 5$  and  $a \geq -5$

46. What is  $\cos \frac{5\pi}{12}$  given that  $\frac{5\pi}{12} = \frac{\pi}{4} + \frac{\pi}{6}$  and that  $\cos(\alpha + \beta) = (\cos \alpha)(\cos \beta) - (\sin \alpha)(\sin \beta)$ ? (Note: You may use the following table of values.)

$\theta$	$\sin \theta$	$\cos \theta$
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$

- F.  $\frac{1}{4}$   
G.  $\frac{1}{2}$   
H.  $\frac{\sqrt{6} - \sqrt{2}}{4}$   
J.  $\frac{\sqrt{3} - \sqrt{2}}{2}$   
K.  $\frac{\sqrt{6} + 2}{4}$

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DO YOUR FIGURING HERE.

47. If  $y \neq z$ , what are the real values of  $x$  that make the following inequality true?

$$\frac{xy - xz}{3y - 3z} < 0$$

- A. All negative real numbers  
B. All positive real numbers  
C.  $-\frac{1}{3}$  only  
D.  $\frac{1}{3}$  only  
E. 3 only

48. The perimeter of a square is 36 units. How many units long is the diagonal of the square?

- F. 8  
G.  $9\sqrt{2}$   
H. 16  
J. 18  
K.  $18\sqrt{3}$

49. What is the equation of the circle in the standard  $(x, y)$  coordinate plane that has a radius of 4 units and the same center as the circle determined by  $x^2 + y^2 - 6y + 4 = 0$ ?

- A.  $x^2 + y^2 = -4$   
B.  $(x + 3)^2 + y^2 = 16$   
C.  $(x - 3)^2 + y^2 = 16$   
D.  $x^2 + (y + 3)^2 = 16$   
E.  $x^2 + (y - 3)^2 = 16$

50. A rectangular kitchen is 8 feet longer than it is wide. Its area is 240 square feet. How long, in feet, is it?

- F. 12  
G. 16  
H. 20  
J. 24  
K. 30

51. What is the slope of a line that is parallel to the line determined by the equation  $5x - 4y = 8$ ?

- A. -4  
B.  $-\frac{5}{4}$

- C.  $\frac{5}{4}$   
D. 2  
E. 4

52. If  $3^{8x} = 81^{3x-2}$ , what is the value of  $x$ ?

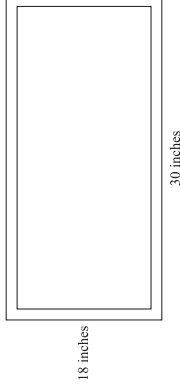
- F. -2  
G. 0  
H. 2  
J. 3  
K. 4

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DO YOUR FIGURING HERE.

53. The picture shown below has a uniform frame-width of  $\frac{5}{8}$  inches. What is the approximate area, in square inches, of the viewable portion of the picture?



- A. 426.25  
B. 481.56  
C. 510.40  
D. 510.75  
E. 540.00

54. A horse eats 12 bales of hay in 5 days. At this rate, how many bales of hay does the horse eat in  $5 + x$  days?

- F.  $12 + \frac{12x}{5}$   
G.  $12 + \frac{x}{5}$   
H.  $\frac{12}{5} + \frac{12}{5x}$   
J.  $\frac{12}{5} + \frac{x}{5}$   
K.  $\frac{12}{5} + x$

55. When graphed in the standard  $(x, y)$  coordinate plane, the lines  $x = -5$  and  $y = x - 5$  intersect at what point?

- A.  $(-5, -10)$   
B.  $(-5, -5)$   
C.  $(-5, 0)$   
D.  $(0, -5)$   
E.  $(0, 0)$

56. Which of the following expresses the number of miles a runner must travel in a 4-lap race where the course is a circle of radius  $m$  miles?

- F.  $4m$   
G.  $4\pi m$   
H.  $4\pi m^2$   
J.  $8\pi m$   
K.  $16\pi m$

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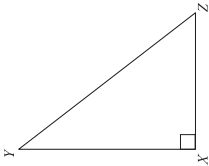


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57. For some real number  $n$ , the graph of the line  $y = (n + 1)x + 6$  in the standard  $(x, y)$  coordinate plane passes through  $(4, 8)$ . What is the value of  $n$ ?
- A.  $-\frac{3}{2}$   
B.  $-\frac{1}{2}$   
C.  $\frac{1}{2}$   
D.  $\frac{3}{2}$   
E. 2

58. A computer repair person charges \$50.00 per hour, plus an additional mileage fee. The charge for mileage varies directly with the square root of the number of miles traveled. If one hour plus 25 miles traveled costs \$140.00, what is the total amount charged for one hour plus 36 miles traveled?
- F. \$218.00  
G. \$196.92  
H. \$179.60  
J. \$158.00  
K. \$143.60

59. In the right triangle below,  $YZ = 10$  units, and  $XZ = 4$  units. What is  $\sin Z$ ?



- A.  $\frac{4}{10}$   
B.  $\frac{10}{2\sqrt{21}}$   
C.  $\frac{2\sqrt{21}}{10}$   
D.  $\frac{10}{4}$   
E.  $\frac{4}{2\sqrt{21}}$

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DO YOUR FIGURING HERE.

60. A triangle,  $\triangle ABD$ , is reflected across the line  $y = x$  to have the image  $\triangle A'B'D'$  in the standard  $(x, y)$  coordinate plane: thus A reflects to  $A'$ . The coordinates of point A are  $(m, n)$ . What are the coordinates of point  $A'$ ?
- F.  $(-m, n)$   
G.  $(m, -n)$   
H.  $(-m, -n)$   
J.  $(n, m)$   
K. Cannot be determined from the given information.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

END OF THE MATHEMATICS TEST.